Appendix A: Derive Phantom Weight Formula

To derive the formula to calculate the phantom weight start with the formula for calculating the capacity a partition's weight represents. We want the capacity represented by the partition's weight to equal the soft cap.

$$\text{Soft\_cap} = [\text{Partition\_weight} / (\Sigma\ \text{All\_partition\_weights} + \text{Phantom\_weight})] \times \text{Capacity}$$

Solve for the Phantom_weight

$$\Sigma\ \text{All\_partition\_weights} + \text{Phantom\_weight} = (\text{Partition\_weight} / \text{Soft\_cap}) \times \text{Capacity}$$

$$\text{Phantom\_weight} = (\text{Partition\_weight} / \text{Soft\_cap}) \times \text{Capacity} - \Sigma\ \text{All\_partition\_weights}$$

Appendix B: Derive Cap Percentage Formula

To derive the formula for calculating the percentage of time a partition should be capped start with the formula for calculating the average CPU capacity used by a partition that is capped a percentage P of the time:

$$C_{avg} = P \times C_{capped} + (1 - P) \times C_{uncapped}$$

Solving for P:

$$C_{avg} = P(C_{capped} - C_{uncapped}) + C_{uncapped}$$

$$C_{avg} - C_{uncapped} = P(C_{capped} - C_{uncapped})$$

$$P = (C_{uncapped} - C_{avg}) / (C_{uncapped} - C_{capped})$$

Since we want to calculate P when the average CPU capacity equals the soft cap, replace C_{avg} with $C_{softcap}$:

$$P = (C_{uncapped} - C_{softcap}) / (C_{uncapped} - C_{capped})$$